trace, doubtless due to tremor of the mirror, and, though not so well marked, yet quite similar in character to the gaps described in a previous letter (NATURE, No. 1410, November 5, 1896); at 5.32 p.m. another abrupt movement to the north, and a similar one at 1h. 20m. after midnight. The three abrupt movements have been compared with the mean of two measures of the sensitiveness of the instrument, and show tilts in the mirror frame of 1·6, 1·1, and 1·3 seconds of arc respectively. In each case the mirror returned to the normal position slowly after a period of from 2 to 4 hours.

On the other date given by Prof. Milne—February 13—there is only a slight trace of irregularity in the curve, consisting of a bend towards the north at 8h. 2m. a.m., the mirror returning to its original position three hours later.

On dates more recent than those to which Prof. Milne calls attention, several disturbances have been recorded here. Of these the most strongly marked are: an abrupt north movement on February 16 at 8 p.m., and another on the 17th at 3 a.m. On the 18th there is a similar movement to the south at 6.15 a.m., followed by two smaller oscillations in the opposite direction, the three covering a period of 1½ hours. On February 19 there are two well-marked gaps, precisely similar in character to those described in the letter above referred to.

THOMAS HEATH.

Royal Observatory, Edinburgh, March 2.

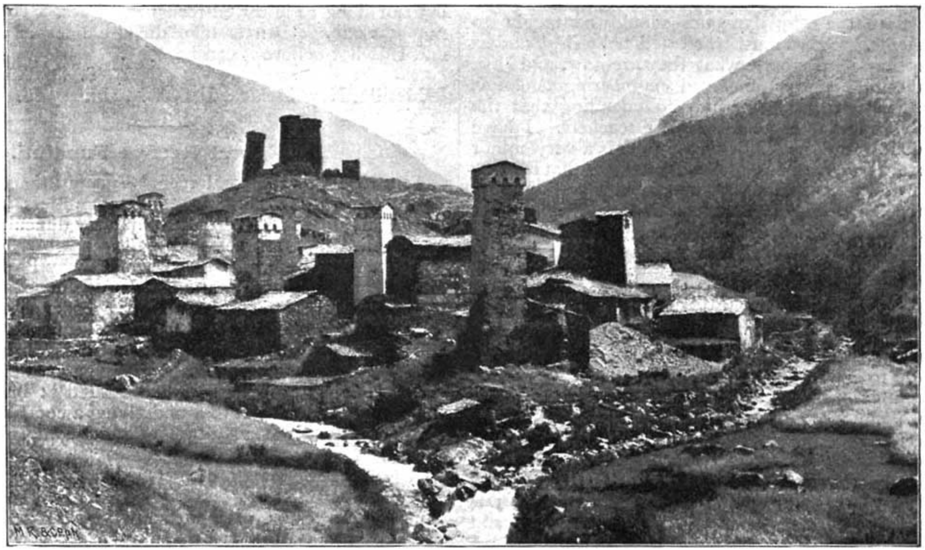

FIG. 1.—Ushkul. [*From a photograph by Vittorio Sella.*

The Origin of Manna.

THE note in NATURE, p. 349, concerning the "manna," reminds me of a passage in Daniele Bartoli's "Asia."

Speaking of the island of Ormuz—which is described as one of the places in the world worst supplied in even commonest necessities of life, and scarcely having any water—the historian tells us that "not even thorns and briars could grow on its barren soil; no animals or birds (*sic*) are seen there all the year round, but every morning a dew falls which congeals into grains, has a very sweet taste, and is called 'manna.'"

Now, tamarisks affect sandy soils or brackish shores; and as *T. mannifera* grows in Arabia, it may be that the exudations from the plants were blown from Oman, on the eastern shore of Arabia, across the Persian Gulf; or, perhaps, from the nearer coast of Persia. This would seem to confirm the belief that manna is the product of the tamarisk, and not of a lichen.

Tooting College, S.W., February 26. B. TIMOTHY.

"Heterocephalus glaber" in North Somaliland.

IN reference to the note given in NATURE (vol. lv. p. 301) on the mammals collected in North-east Africa by Dr. Donaldson Smith, it may interest some of your readers to learn that in October 1892 Captain V. Bòttego obtained no less than eighteen specimens of that most singular rodent, *Heterocephalus glaber*, in one day, at the Wells of Herrer, near Archeisa, in North Somaliland. Sixteen specimens, well preserved in alcohol, were forwarded by him to Marquis Giacomo Doria, and have been distributed to various museums through the learned Director of the Museo Civico of Genoa. In his book ("Il Giuba esplorato," pp. 38–41, Roma, 1895) Captain Bòttego figures the *Heterocephalus*, and also one of their colonies of singular conical mole-hills.

Florence, February 24. HENRY H. GIGLIOLI.

THE CAUCASUS.[1]

LITTLE though the methods and spirit of sport have in common with those of science, each subject is greatly indebted to the other. Our knowledge of the habits of big game is mainly due to hunters; and for the first great advances in mountain cartography and in the study of high mountain regions, we are indebted to climbers. In the early days of the Alpine Club some of its members, at the suggestion of John Ball, placed instruments on summits that were accessible only to trained mountaineers, and thus obtained meteorological records much wanted at that time. Subsequently, another group of members of the Alpine Club turned their attention to the Caucasus, where their explorations resulted in the first accurate knowledge of its lofty summits and its great snow-fields and glaciers. Of the Alpine climbers who have taken part in this work, Mr. Douglas Freshfield was one of the earliest, was the best qualified as a geographer, and has been by far the most persistent. His "Central Caucasus and Bashan" (1869), which has taken place as an Alpine classic, helped to rouse the first interest in England regarding the former mountains; and now, after thirty years' further work has been done, he has collected the principal results into a monograph, which is unquestionably the best illustrated book in the literature of mountaineering.

Mr. Freshfield begins with a chapter on the "Discoverers of the Caucasus," occupied largely by reference to the English expeditions, to which our knowledge of its highest peaks is due. He then describes "the characteristics of the Caucasus," comparing the range with the Alps, and referring to the most striking features in its flora, and stating the extent of its glaciers. After a brief summary of the political history of the region, he proceeds to his main task—a description of the principal peaks or groups of peaks, and a narrative of the first and, sometimes also of one or two, later ascents. In the second volume the chapters on the mountains and mountaineering are continued, and include contributions by Messrs. H. W. Holder, J. G. Cockin, Hermann Woolley, and Maurice de Déchy. The chapter in the book of most special interest to naturalists, both from its subject and the originality of its treatment, is that contributed by Prof. Bonney. It deals with "the physical history of the Caucasus," and is illustrated by a geological map prepared by Mr. Reeves. Prof. Bonney points out that the Caucasus agrees more closely with the Pyrenees than with the Alps: for it is approximately a single chain formed by an isoclinal fold, and is much simpler than the Alps, both in history and structure. Thus, although part of the Caucasian region was occupied by land at intervals during the Palæozoic and Mesozoic eras, it was not until between the Eocene and the Miocene that a mountain chain was formed there. The height was increased by a second series of earth-movements, which happened in the Pliocene. In structure the main chain consists of a band of gneiss, flanked by crystalline schists, which, at two localities, form the central watershed. On the southern side the schists are succeeded by Palæozoic clay slates, while parallel to the main range, and on both sides of it, there are belts of Jurassic, Cretaceous, and Cainozoic deposits. Some of the later deposits rise to a considerable height on the flanks: thus some fossils found by Sella on the summit of the Laila, prove the presence there of some Neozoic deposit; this is said to be Lower Jurassic or Cretaceo-Eocene. As Fournier's recent section shows that there are Eocene rocks only a little to the south of the Laila, and that they occur as a monoclinal fold, of which the northern limb is lost, there is nothing impossible in the view that the fossils belong to the later period.

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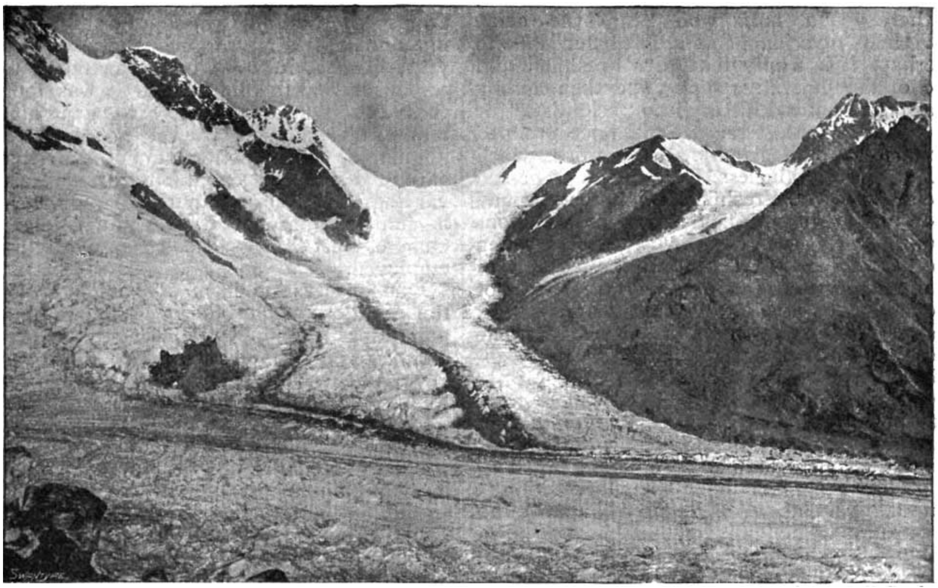
[1] "The Exploration of the Caucasus." By Douglas W. Freshfield. With illustrations by Vittorio Sella. Imp. 8vo. 2 vols. Pp. xxiii + 278; pp. x + 295; with 3 maps and 76 full-page illustrations, and 2 mountain panoramas. (London: Edward Arnold, 1896.)



[From a photograph by W. F. Donkin.

FIG. 2.—The Zanner Passes.

Prof. Bonney's lucid sketch of Caucasian history is the first of the appendices, the rest of which include the climbing record, tables of temperature and rainfall, a list of the heights at which the glacier snouts occur, and a very short list of literature. One of the principal features of the book is its illustrations. Most of them are Signor Sella's photographs reproduced by the Meisenbach Company; a few, including one or two of the best, such as the view of Ushba and the Chalaat Glacier, are by the Swan Electric Engraving Company. Mr. Freshfield has accepted photographs, as indispensable in such a work as the present, where precision of detail is required; but he frankly confesses his personal preference for engravings. This, however, as he aptly remarks, is not to be taken as a preference for art to accuracy, but for general truth to local detail. The photographs are so numerous and so superbly reproduced, that they show local detail in extraordinary fulness; and the views are so well chosen, that they are as beautiful as they are instructive, as accurate as they are artistic. By the courtesy of the publishers, two of the half-tone illustrations are here reproduced.

With the exception of the journals of Alpine gymnasts, the average book on mountaineering takes a higher place as literature than that of any other class of travel. The author's literary style is too well known to need any commendation here, and it need only be remarked that the present work ranks with the best of Alpine literature. There is one point, however, which is open to criticism. In his endeavour to avoid using "words of terror," which alarm general readers and break the music of sentences, Mr. Freshfield has not followed any definite system of transliterating place-names. Accordingly, to discover Mr. Freshfield's localities on the recent French map of Fournier, or on any Russian map, is a puzzle that requires ingenuity and patience; while to find his names in a Russian index is sometimes almost impossible. Thus ч is sometimes transliterated *ch*, and at other times *tsh*; ж is rendered as *j* or *dj*; *k* may stand either for the Russian к or х, while *kh* also represents both these letters. The letter *z* comes from either з or ц; *b* or *v* from в; *u*, *y* and *i* from ы; and *a* from а or я; and *e* from е or э. Sometimes the Russian о is given its phonetic equivalent of *a*, but at other times, when it has the same pronunciation, it is rendered by *o*. Hence in retransliterating some of the author's place-names into Russian, there are so many available alternatives that certainty is impossible.

The spelling of place-names, however, is a detail with which the general reader has no concern; but Mr. Freshfield's compromises form pitfalls for the students who may use the volume. With the difficulties of the "scientist" the author has scant sympathy. A current of delightful and subtle sarcasm runs all through the book; and the unlucky "scientist" comes in for all the author's hardest hits and most racy banter. At first sight it appears that the three main sins of the man of science are his narrow specialism, his pernicious habit of publishing "scattered communications" in scientific serials, and his delusion that a climber is not necessarily a geologist. The author, however, fortunately defines the sense in which he uses the word "scientist": he means thereby "a man who bears the same relation to a 'man of science' as a poetaster does to a poet." Perhaps it is a pity that Mr. Freshfield did not make use of the pejorative *-aster*, and then classify writers on Caucasian natural history into "scientists" or men of science, and scientasters. Häckel once grouped into one section of a bibliography, all the works which he regarded as quite valueless. He never repeated this experiment; and Mr. Freshfield might have found the publication of a list of scientasters a more dangerous feat than any of his first ascents in the Caucasus. When we come to definite cases, we find that the man of science is blamed for the sins of those who are not men of science, and are hardly scientasters. Mr. Freshfield is severe on the man of science for the mistakes made in underrating the area of the Caucasian glaciers. He promises, on the principle of *corruptio optimi pessima*, that he will only quote from "writers of authority." Then he proceeds to quote from Keith Johnston and Reclus. But they are compilers and not original authorities; and judging from some of the extracts given, we should think the introduction of the word compilaster is urgently required. The quotations from the "Géographie Universelle" afford an illustration of a devotion to obsolete authorities not unusual among anarchists. If a man of science wanted accurate information about Caucasian glaciers, he would not go to books where the information is given second-hand and often third-hand, but to the series of papers by Zhukov in *Zemlevyedyenie*, or the elaborate monograph by Dinnik in the *Zap. Kavkaz. Otd. Russ. Gheoghr. Obshch.* But we cannot find any reference to either author in the volumes, although we have searched for the latter as Dinnik, Djinnikh, Jinnik, Schinnik, and Finik. So we presume he is either a "scientist" or a quasi-scientist or a scientaster, and that his elaborate monograph only "darkens with vain words" the 130 pages of the serial on which it is printed. The complaint is made that men of science have not always given his climbing colleagues fair credit for the results they have obtained. If climbers had always worked as carefully, and observed as thoroughly as Mr. Freshfield, and if they had possessed the critical geographical instinct shown on every page he has contributed to these volumes, the criticisms in question would probably never have been made. The latest scientific work on the Caucasus expresses full acknowledgment of the work of "les hardis alpinistes anglais." And with the present work before him, no one can doubt the value of the contributions which climbers have made to scientific geography.

J. W. G.

THE EXTRACTION OF AN ALCOHOL-PRODUCING FERMENT FROM YEAST.

IT has long been currently taught that the alcoholic fermentation of sugar by yeast differs from the more common hydrolytic processes of the ordinary enzymes, inasmuch as it is intimately associated with, and directly dependent on, the living action of the yeast cell. But some investigators have believed that, notwithstanding the apparent impossibility of separating an alcoholic ferment from the organism, such a body nevertheless exists, and that alcoholic fermentation is thus, after all, only a special case of ordinary enzyme action, although, no doubt, one of peculiar complexity.

These views have just received a remarkable confirmation at the hands of Dr. E. Buchner, who has communicated the results of his researches on this problem in a short but important paper, entitled "Alcoholische Gährung ohne Hefezellen," which will be found in the first number of the *Ber. d. deutsch. Chem. Gesellsch.* for the present year. The author, by pounding up pure yeast with quartz sand, and adding a certain amount of water, was able to squeeze out, under a pressure of 4–500 atmospheres, a liquid which, after thorough filtering, was of an opalescent appearance, and possessed an agreeable yeast-like odour. All care was taken to exclude any organism from the liquid, and it was found that under these conditions it was able to excite alcoholic fermentation in solutions of suitable sugars. Thus, on adding a quantity to an equal volume of cane-sugar, bubbles of carbon dioxide appeared after the lapse of an interval varying from fifteen minutes to an hour. Grape-sugar is similarly fermented, but milk-sugar undergoes no change, just as is the case when living yeast is employed.

One observation is of especial interest, namely, that the addition of chloroform, even up to the saturation point, does not inhibit the fermentative process, although it causes a rapid precipitation of albuminous substances from the liquid. This seems to prove conclusively that we are not here dealing with a body which is still living, in the ordinary acceptation of the term.

If the expressed liquid be heated to a temperature of about 50° C. coagulation occurs, and the power of exciting fermentation is lost both by the coagulum and by the remaining liquid. It was also found that in the active liquid the ferment itself diffuses very slowly, if at all, through parchment-paper (*pergament-papier*).

On the whole, the evidence at present before us seems to indicate that the ferment, which its discoverer has called Zymase, is possibly of a proteid nature. Dr. Buchner believes that this is certainly the case, though until it has been separated from the rest of the heterogeneous substances, some at least of which are proteids, the question as to its real constitution can hardly be regarded as decided.

Buchner, whilst believing that the process of normal fermentation can go on within the body of the yeast cell itself, considers it as yet more probable that the Zymase is actually excreted into the sugar solution by the living organism. At any rate, it would seem that proteids can pass out of the cells into the surrounding liquid, for if the yeast be sown in a slightly alkaline solution of cane-sugar, and some of the fermenting fluid be examined after some hours have elapsed, it is found to contain a considerable quantity of a substance which coagulates on heating, and which is stated to be of an albuminous nature.

This brief sketch of Buchner's work will suffice to indicate not only its great theoretical interest, but also its practical importance in connection with those industries which are more directly concerned with fermentative processes.

J. B. F.